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REINFORCEMENT OF THE GREEN LINE OF THE NIGHT SKY GLOW UPON EJECTION
WITH THE AID OF A ROCKET OF TRIMETHYLALUMINUM
INTO THE UPPER ATMOSPHERE

by
Jean-Claude Jeannet

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REINFORCEMENT OF THE GREEN LINE OF THE NIGHT SKY GLOW UPON EJECTION

WITH THE AID OF A ROCKET OF TRIMETHYLALUMINUM

INTO THE UPPER ATMOSPHERE *

Comptes-Rendus de
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by Jean-Claude Jeannet

ABSTRACT

Interferometric and photometric recordings show a reinforced emission of the line 01 5577 at the ejection of $(\text{CH}_3)_3\text{Al}$ into the upper atmosphere and a considerable enlargement of line profile in the first period.

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During the night of 5 to 6 November 1965, there took place on the island of Levant, an experiment of alkaline ejection in the atmosphere with the aid of Centaur rockets. The place of observation (Valensole, Basses-Alpes) was approximately 150 km distant from the launching site.

For the first launching, effected on 5 November about 18 h with an ejection of sodium, we have been informed too late to bring about an

* Renforcement de la raie verte de la lueur nocturne après l'éjection de triméthylaluminium en haute atmosphère à l'aide d'une fusée.

observation.

The second launching occurred on 6 November at 0 h 20 min. The body ejected was $(\text{CH}_3)_3\text{Al}$, giving rise to a luminous spot (azimuth 150° : $z = 50^\circ$).

On this occasion, we have endeavored with the help of a Fabry-Perot index variation-type interferometer, destined for the measurement of the width of the line 01 5577 [1], to continue the study made by M. Perin on 2 March 1960, concerning a sodium ejection at Beni-Abbes (see [1, 2]). But Perin observed only two successive enlarged and deformed fringes, obtained with a Fabry-Perot interferometer in the neighborhood of the luminous spot. Afterwards the weak signal level and the important background noise hindered the obtaining of new fringes.

In order to have additional information concerning this perturbation phenomenon, undergone by the line 01 5577 of alkaline ejections, we have particularly studied the sky in the azimuth of the spot with the aid of a photometer [3] which gives the distribution in the sky of the luminance of the green line for 10 zenithal distances from 0 to 85° , utilizing as reference the intensity at zenith.

For a zenithal distance of 60° (the point closest to the spot: $z = 50^\circ$) and for a field of approximately 2° , we obtain the ratios hereafter, which we compare to ratios deduced by interpolation from the curve relative to the azimuth, setting aside the spot.

We have thus observed a very sudden reinforcement of short duration, presenting an intensity maximum with a lag of approximately 35 min over the ejection.

<u>Hours</u>	<u>Ratio</u>	<u>Interpolated ratio</u>
21 h 20 mn.....	1,30	1,30
0 h 45 mn (H + 25 mn).....	1,89	1,45
0 h 55 mn (H + 35 mn).....	2,88	1,56
1 h 05 mn (H + 45 mn).....	1,40	1,46
1 h 37 mn (H + 1 h 17 mn).....	1,40	1,46

The interferometer functioning for several hours without giving any valid signal, had been aimed, at time of ejection, at the edge of the luminous spot, (azimuth 150° : $z = 55^{\circ}$) of strong intensity at commencement.

Remembering that by variation of the optical track, the interferometer allows the interference rings, given by a monochromatic radiation, to defile in front of the exploratory diaphragm. The Fabry-Perot standard has been calculated in order to determine a line profile, whose Doppler width was estimated to be of the order of 0.01 to 0.02 Å, corresponding to kinetic temperatures of 100 to 400° K.

— If the width of the line is greater than half of the free spectral interval between two successive orders, approximately 0.03 Å, corresponding to 900° K, there is "blurring" of fringes, and we can no longer observe them, which is visible on the recording by a constant or slowly decreasing level (a function of the decrease of the luminous intensity)

— We can equally obtain a similar recording by superimposition of a continuous background of intensity greater than that of the emitted line.

During the night of 5 to 6 November 1964 at H + 15 min, the signal obtained was relatively strong with very irregular fluctuations dur-

ing 6 minutes, then the amplitude of the signal underwent a slow and regular decrease until $H + 50$ min. Then during 7 minutes (of $H + 53$ min to $H + 1$ h) we could register a phenomenon corresponding to a monochromatic radiation (the width of the line having become compatible with the free spectral interval), whose period varied slightly on either side of the value calculation for the line $5\,570\text{ \AA}$ of krypton. Afterwards this phenomenon became too weak to be registered; its short duration did not permit the measurement of the width of the line.

The analysis of these two cases of alkaline ejection in the upper atmosphere (2 March 1960 and 5 November 1964) shows that the excitation of oxygen atoms is:

— either concealed during a sufficiently long period (approximately 1 h, 5 November 1964 and 1 h 30 min, 2 March 1960) by a continuous intensity background decreasing in time;

— or strongly perturbed, while admitting that the line $O\text{I } 5577$ is considerably enlarged by a very high kinetic temperature (at least 900° K).

We propose thus to retake the observations when the occasions are suitable with a modified interferometer in order to permit the study of the profile of very enlarged lines concerning the excitation mechanism in the upper atmosphere.

*** THE END ***

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